DOCUMENT RESUME

ED 327 705 CE 056 767

AUTHOR Engelbrecht, Nancy; And Others
TITLE Calculator Division Fraction to Decimal Conversion Applications of Division. Fundamentals of Occupational Mathematics. Module 6.
INSTITUTION Central Community Coll., Grand Island, NE.
SPONS AGENCY Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE 90
CONTRACT V199A90067
NOTE 15p.; For related modules, see CE 056 762-773.
PUB TYPE Guides - Classroom Use - Materials (For Learner) (051)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Arithmetic; *Calculators; Community Colleges; *Decimal Fractions; *Division; Individualized Instruction; Learning Modules; Mathematical Applications; *Mathematics Instruction; Measurement; Number Concepts; Numbers; Pacing; Two Year Colleges; Vocational Education; *Word Problems (Mathematics)
IDENTIFIERS *Job Related Mathematics

ABSTRACT

This module is the sixth in a series of 12 learning modules designed to teach occupational mathematics. Blocks of informative material and rules are followed by examples and practice problems. The solutions to the practice problems are found at the end of the module. Specific topics covered include calculator division, mixed number fractions, division of measurements, fraction to decimal conversion, rules of accuracy, and word problems. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

V199A90067

ED327705

Fundamentals of OCCUPATIONAL MATHEMATICS

Module 6

Calculator Division Fraction to Decimal Conversion Applications of Division

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Name _____

Material produced by Central Community College—Platte Campus. Funded by a grant from the U.S. Department of Education, Office of Vocational/Adult Education.

CE056767

Project Director
Ron Vorderstrasse

Project Secretary
Jan Wisialowski

Technical Consultant
Ray Plankinton

Technical Writers
Nancy Engelbrecht
Lynne Graf
Ann Hunter
Stacey Oakes

©Copyright, Central Community College

Module 6--Calculator Division Fraction to Decimal Conversion Applications of Division

Division is the fourth and final basic operation. It is the best operation to use when one needs to find out how many times one value is contained in another value. Suppose that one needs to know how many pieces of 15 mm length can be cut from a stock item that is 100 mm long. One could begin solving by subtracting the first piece 100 mm - 15 mm = 85 mm to determine the amount left. After a second piece, 85 mm- 15 mm = 70 mm is left. The third piece leaves 70 mm - 15 mm = 55 mm. A fourth cut leaves 55 mm - 15 mm = 40 mm. The fifth leaves 40 mm - 15 mm or 25 mm and finally, the sixth produces 25 mm - 15 mm = 10 mm, a piece too short to provide for another 15 mm. The total number of 15's contained in 100 was found to be 6 with remainder 10.

That was not a very efficient way to solve the problem, but then subtraction is not the best operation to use in this case. Division is the fastest operation to use when one needs to find out how many times 15 mm is contained in 100 mm. The division of 100 ÷ 15 gives the answer of 6.666666667. The whole number 6 tells how many complete 15's are contained in 100 and the decimal .666666667 represents the remainder.

The other situations, when division is the operation to use, are those where the answer to a multiplication and one of the factors are known. The other factor can be found by division. For instance, if the product of two numbers is 180 and one of the factors is 36, then the other factor is 180 ÷ 36 = 5.

A division problem can be written in three forms. The division of m by n which has the answer q can be shown as:

$m \div n = q$ or $n\overline{)m}^{\,q}$ or $\frac{m}{n} = q$.

In each case, m is called the **DIVIDEND**, n the **DIVISOR** and q the **QUOTIENT**.

EXAMPLE 1: Calculate 473.9 ÷ 18.7 and round the quotient to the nearest hundredth.

Solution: Calculator steps for division are shown below.

Directions	Key strokes	Display
Enter dividend	4 7 3 . 9	473.9
Divide	÷	473.9
Enter divisor	1 8 . 7	18.7
End division	=	25.34224599
Quotient to nearest hundredth is 25.34		

EXAMPLE 2: Calculate 31.87 ÷ 86.3 and round the quotient to four significant digits.

Solution:

Directions	Key Strokes	Display
Enter dividend	3 1 . 8 7	31.87
Divide	÷	31.87
Enter divisor	8 6 . 3	86.3
End divide	=	0.369293163
Quotient to 4 digit accuracy is 0.3693		

EXAMPLE 3: Compute $\frac{217.95}{70.2}$ accurate to three significant digits.

Solution:

$\frac{217.95}{70.2}$ is the same as $217.95 \div 70.2$

Directions	Key Strokes	Display
Enter dividend	2 1 7 . 9 5	217.95
Divide	÷	217.95
Enter divisor	7 0 . 2	70.2
End division	=	3.104700855
The quotient in 3 digit accuracy is 3.10		

PRACTICE PROBLEMS: Calculate the following quotients and round the result to three digit accuracy.

1. $28.36 \div 4.07$
2. $\frac{27.2}{0.084}$
3. $0.075 \div 6.1$
4. $\frac{7.924}{187.3}$
5. $0.0865 \div 0.192$
6. $\frac{79.5}{0.026}$
7. $723.9 \div 48.3$
8. $\frac{609}{265.3}$

Calculate the following quotients and round the result to the nearest thousandth.

9. $\frac{7.82}{4.06}$
10. $\frac{2.917}{3.86}$
11. $\frac{0.175}{3.47}$
12. $287.4 \div 90.9$
13. $0.429 \div 62.5$
14. $1.648 \div 23.6$

Division is the operation which changes the common fractions into an equal decimal amount. Simple fractions written as m/n are changed into their decimal equivalent using $m \div n$.

EXAMPLE 4: Change the following simple fractions into decimals.

(a) $\frac{7}{16}$ =

(b) $\frac{9}{32}$ =

(c) $\frac{23}{8}$ =

Solution:

(a) $\frac{7}{16} = 7 \div 16 = 0.4375$

(b) $\frac{9}{32} = 9 \div 32 = 0.28125$

(c) $\frac{23}{8} = 23 \div 8 = 2.875$

Mixed number fractions are a combination of a whole number and a simple fraction. For instance, 3 5/8 is the addition of whole number 3 and simple fraction 5/8. That is, 3 5/8 = 3 + 5/8 = 5/8 + 3. To calculate the decimal value of a mixed number fraction, change the fraction part to a decimal and add the whole number.

EXAMPLE 5: Change the following mixed number fractions into a decimal.

(a) 3 5/8

(b) 7 11/16

Solution:

(a) 3 5/8 = 3 + 5/8 = 5/8 + 3
= 5 ÷ 8 + 3
= 0.625 + 3
= 3.625

(b) 7 11/16 = 7 + 11/16 = 11/16 + 7
= 11 ÷ 16 + 7
= 0.6875 + 7
= 7.6875

PRACTICE PROBLEMS: Change the given fractions and mixed fractions into an equivalent decimal.

15. 3/8	16. 13/16
17. 17/32	18. 1 19/64
19. 3 1/16	20. 2 1/4
21. 4 3/16	22. 3 9/32
23. 5 5/64	24. 1 7/32

When the two numbers involved in a division operation are both measurements, then the operation plays a major role in determining both the resulting unit of measure and the number value. The next examples are selected to support general statements about the final unit of measure when the units for the divisor and dividend are similar in some unit.

EXAMPLE 6: Into how many 9 in. pieces can a 144 in. bar be cut?

Solution:

$$144 \text{ in.} \div 9 \text{ in.} = (144 \div 9)\ (\text{in.} \div \text{in.})$$
$$= 16$$

EXAMPLE 7: How many 12 mm pieces can be cut from a 120 mm long band of steel?

Solution:

$$120 \text{ mm} \div 12 \text{ mm} = (120 \div 14)(\text{mm} \div \text{mm})$$
$$\approx 8.571$$
$$\approx 8$$

EXAMPLE 8: How many rectangles with a 16 in^2 area can be cut from a sheet whose area is 1152 in^2?

Solution:

$$1152 \text{ in}^2 \div 16 \text{ in}^2 = (1152 \div 16)(\text{in}^2 \div \text{in}^2)$$
$$= 72$$

The problems in Examples 6, 7 and 8 had exactly the same unit of measure in both divisor and dividend. Their answers had no unit of measure.

RULE: When two measurements which have exactly the same unit of measure are divided, the units of measure cancel each other and the quotient has no unit of measure.

EXAMPLE 9: How wide is the rectangle whose area is 48 in^2 and length is 12 in.?

Solution: We need the missing factor of "12 in. times what is 48 in^2."

$$\begin{aligned} \text{width} &= 48\ in^2 \div 12\ in \\ &= (48 \div 12)(in^2 \div in) \\ &= 4\ in \end{aligned}$$

Note that $in^2 \div in = in$.

EXAMPLE 10: How big is the top of a rectangular block with a volume of 240 mm^3 and a height of 15 mm?

Solution: We need to find the missing factor in, "What is 15 mm multiplied by to make 240 mm^3?"

$$\begin{aligned} \text{top} &= (240 \div 15)(mm^3 \div mm) \\ &= 16\ mm^2 \end{aligned}$$

Note that $mm^3 \div mm = mm^2$.

RULE: When dividing measurements where the dividend unit of measure and the divisor unit of measure have some common unit, then the quotient will have the unit of measure remaining after cancelling that common unit.

Consider some examples where the dividend and divisor have no common unit of measure.

EXAMPLE 11: How fast is an axle turning if it makes 9000 revolutions during a 6 minute time interval?

Solution:

$$\begin{aligned} \text{speed} &= (9000 \text{ revolutions}) \div (6 \text{ minutes}) \\ &= (9000 \div 6)\ (\text{revolutions} \div \text{minutes}) \\ &= 1500 \text{ revolutions per minute} \\ &= 1500 \text{ rpm} \end{aligned}$$

EXAMPLE 12: What is the production rate of an employee who produces 424 parts in an 8 hour day?

Solution:

$$\begin{aligned} \text{production rate} &= (424 \text{ parts}) \div (8 \text{ hour}) \\ &= (424 \div 8)\ (\text{parts} \div \text{hr.}) \\ &= 53 \text{ parts per hour} \end{aligned}$$

RULE: When dividing measurements where the dividend unit of measure and divisor unit of measure have nothing common about their units, then the quotient will have the unit of measure named as dividend unit PER divisor unit.

Other examples in which the units of measure do not cancel include problems resulting in units like miles per hour, feet per second, dollars per hour, pounds per cubic foot and inches per

revolution.

PRACTICE PROBLEMS: Determine the quotient and final unit of measure, if any, for the division problems.

25. 336 mm ÷ 16 mm
26. 153 in. ÷ 9 in.
27. 1320 mm ÷ 24 mm
28. 192 in^2 ÷ 16 in.
29. 6180 mm^2 ÷ 60 mm
30. 4250 mm^3 ÷ 250 mm^2
31. 2520 in^3 ÷ 35 in.
32. 2250 revolutions ÷ 3 minutes
33. \$224 ÷ 40 hours
34. 7920 feet ÷ 90 seconds
35. 914.4 mm ÷ 36 in.
36. 468 pounds ÷ 18 in^2

The accuracy of the number which results from a division of measurements must reflect the accuracy of the instruments used in making the measurements. The rule to follow when measurements are used in division is essentially identical to the steps of the rule of accuracy when multiplying.

RULES OF ACCURACY FOR DIVISION OF MEASUREMENTS

To divide measurements:

1) First, divide the measurements as given.

2) Round the final quotient to the same number of significant digits as the measurement which has the least number of significant digits.

EXAMPLE 13: Apply the rule of division of measurements and the rules of units of measure in computing the quotients.

(a) 28,800 ft^3 ÷ 216 ft

(b) 279.5 lb ÷ 2.84 ft^3

Solution:

(a) Both 28,800 and 216 are 3 digit accurate measurements.

$$28{,}800\ ft^3 \div 216\ ft = (28{,}800 \div 216)(ft^3 \div ft)$$
$$= 133.3333333\ ft^2$$
$$\approx 133\ ft^2$$

(b) The least accurate measurement is the 2.84 ft^3: 3 digit.

$$279.5\ lb \div 2.84\ ft^3 = (279.5 \div 2.84)(lb \div ft^3)$$
$$= 98.41549296\ lb\ per\ ft^3$$
$$\approx 98.4\ lb\ per\ ft^3$$

While working through the next few examples and the practice problems which follow, remember what students are trying to learn. The purpose of word problems is to become experienced in situations which require division. A student needs to learn WHEN to divide. After completion of a problem, review the information which described WHEN a particular operation was the one to be used.

Some situations which suggest that the division m÷n is the operation to use are:

1) How many times is n contained in m?
2) n multiplied by what makes m?
3) The answer is to be expressed in m's unit per n's unit.

EXAMPLE 14: How many pieces of length 36.0 mm can be cut from an angle iron that is 186.4 mm long? How long is the piece of scrap that is left?

Solution: First, compute how many 36's are contained in 186.4. Best operation is division:

$$186.4 \div 36 = q.$$

Next, find the length of the scrap.

Directions	Key Strokes	Display
Enter 186.4	1 8 6 . 4	186.4
Divide	÷	186.4
Enter 36.0	3 6	36.
End divide	=	5.177777778

The answer to the first question is 5 pieces.

The next steps calculate the scrap length by formula
(q - its whole number) (divisor)

Leave last display		5.177777778
Subtract	[-]	5.177777778
Enter 5	[5]	5.
End subtract	[=]	0.1777777778
Multiply	[x]	0.1777777778
Enter divisor 36	[3] [6]	36.
End problem	[=]	6.4

Scrap piece is 6.4 mm long.

EXAMPLE 15: How many pieces 7.25" long can be cut from angle stock that is 120" long? How long is the piece of scrap that is left?

Solution: The number of pieces is the whole number portion of 120 ÷ 7.25

Directions	Key Strokes	Display
Enter 120	[1] [2] [0]	120.
Divide	[÷]	120.
Enter 7.25	[7] [.] [2] [5]	7.25
End divide	[=]	16.55172414

The first solution is 16 pieces.

The scrap piece has length of (decimal part)·(divisor)

Leave last display		16.55172414
Subtract	[-]	16.55172414
Enter whole number	[1] [6]	16.
End subtract	[=]	0.551724137
Multiply	[x]	0.551724137
Enter divisor	[7] [.] [2] [5]	7.25
End problem	[=]	4

Scrap piece is 4 in. long.

EXAMPLE 16: What is the gasoline consumption in miles per gallon of an automobile which uses 16.7 gallons of gas to go 429.6 miles?

Solution: To compute miles per gallon is WHEN to divide. Miles per gallon means miles ÷ gallons. Gallons of gas was measured to 3 digit accuracy.

Consumption = 429.6 miles ÷ 16.7 gal.
= (429.6 ÷ 16.7)(mi. ÷ gal)
= 25.7245509 mpg
≈ 25.7 mpg

PRACTICE PROBLEMS: Use the rules of division of measurements to evaluate

37. $360\ ft^2 \div 12\ ft$
38. $9180\ yd^3 \div 36\ yd^2$
39. $62{,}500\ in^3 \div 25\ in.$
40. $1520\ m^3 \div 40\ m$
41. $4800\ volts \div 14.2\ amps$
42. $288{,}000\ ft^3 \div 216\ ft$

Solve the following application word problems. Follow the rule of accuracy in expressing the number value of your solution. Include the correct unit of measure.

43. A 78 foot cable is to be cut into 3.25 foot lengths. Into how many lengths can the cable be cut?

44. How many metal sheets are in a stack that measures 18 inches high if each sheet is 0.0060 in. thick?

45. A shop foreman may spend $335 to use as overtime to complete a job. Overtime pay is $16.75 per hour. How many hours of overtime may he use?

46. The cutting tool on a lathe moves 3/128 in. along the piece, being turned for each revolution of work. How many revolutions will it take to turn a length of 9 9/64 in. stock in one operation?

47. How many lengths of wire each 3 3/4 in. long, can be cut from a 250 in. roll?

48. Two metal strips are riveted together in a straight line, with 6 equally spaced rivets. The distance between the first and last rivet is 28 1/8 in. What is the distance between any two consecutive rivets?
Caution: Count spaces, not rivets.

49. A total of 19 holes are to be equally spaced in a straight line between two points. The first .and last hole are to have their centers 130.5 mm apart. . How far apart will the centers of two consecutive holes be?
Caution: Count spaces, not holes.

50. A steel rod 32.63 in. long is to be cut into 3.56 in. long pieces. Each cut wastes 0.15 in. of rod in shavings.
(a) How many pieces can be cut and
(b) how many inches of rod are left as waste?

SOLUTIONS TO PRACTICE PROBLEMS--Module 6

1.	6.97	2.	324	3.	0.0123
4.	0.0423	5.	0.451	6.	3060
7.	15.0	8.	2.30	9.	1.926
10.	0.756	11.	0.050	12.	3.162
13.	0.007	14.	0.070	15.	0.375
16.	0.8125	17.	1.21875	18.	1.296875
19.	3.125	20.	2.25	21.	4.1875
22.	3.28125	23.	5.078125	24.	1.21875
25.	21	26.	17	27.	55
28.	12 in.	29.	103 mm	30.	17 mm
31.	72 in^2	32.	750 revolutions per minute		
33.	$5.60 per hr	34.	88 ft per second		
35.	25 mm per in.	36.	26 lbs per in^2	37.	30 ft
38.	260 yd	39.	2500 in^2	40.	40 m
41.	340 volts per amp			42.	1330 ft^2
43.	24	44.	3000	45.	20 hours
46.	390 revolutions			47.	66
48.	5.625 in.	49.	7.25 mm	50.	(a) 8 (b) 2.95 in.